[P4] Crop Genetics and Physiology

2021年9月9日(木) 12:15 ～ 14:00 Room 4 (Poster) (Crop Genetics and Physiology)

12:15 ～ 13:00

[P4-07]Engineering CAM Traits into C3 crops

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Crassulacean acid metabolism (CAM) is a carbon fixation pathway that evolved as an adaptation to limited water availability. CAM species exhibit extremely high water-use efficiency. CO_2 is fixed during the night by phosphoenolpyruvate carboxylase (PEPC) and produced malic acid is accumulated in the vacuole. PEPC is activated by phosphorylation, which is catalyzed by PEPC kinase (PPCK). During the day, the malic acid is decarboxylated to release CO_2 by NADP-malic enzyme (NADP-ME). The PEPC, PPCK, and NADP-ME were encoded by *McPpc1*, *McPPCK* and *Mod1*, respectively. We isolated intron-containing genes (with and without promoter region), cDNA and antisense cDNA of those genes from *Mesembryanthemum crystallinum*. We constructed vectors including the cDNA of *McPpc1* and *McPPCK*, which were fused to a promoter of circadian clock associated1 (CCA1), which regulates gene expression at night, and *Mod1*, which was fused to the promoter of Chlorophyll a-b binding protein (Cab), which regulated gene expression at day. These promoters were isolated from *Arabidopsis thaliana*. We obtained transgenic *Arabidopsis* that expressed *McPpc1* and *McPpck* during the night at a higher level. The expression levels of these genes were about 6 and 3 times higher than those in *M. crystallinum*, respectively. The PEPC activity of *McPpck* transgenic *Arabidopsis* was about 2 times higher than that of non-transformants. We applied the same strategy to rice to confer CAM traits.